DATA PROCESSING DIGEST

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General Information

AUDITING ELECTRONIC RECORDS

Felix Kaufman, Data Processing Counselors, New York; and
Leo A. Schmidt, University of Michigan
THE ACCOUNTING REVIEW, January 1957; pages 33-41

Accountants and controllers will need to know something about the systems and programming aspects of an EDP system in order to keep adequate control of the auditing processes. Public accountants, too, will need to know something about the operation of their clients' EDP systems. This is necessary because, while "the theory, the purpose, and the implications of internal control remain the same... the mechanics will be found to be much different" from those of the punched card installations. One of the difficulties lies in the fact that "the audit trail disappears into the unmarked jungle of electronic circuitry." However, "the essential advantage of electronics lies in this direction--to do away... with awkward, slow-moving, expensive and inefficient 'hard copy.' The ideal of electronics in fact is to move directly from transaction into magnetic bits without even the traditional original evidence in its written form."

The old on-the-scene audit techniques will disappear, and internal audit checks must be built into the machine program when it is set up. The following are some of the changes for which the auditor should be prepared:

1. Internal Control--Departmental lines are blurred or eliminated.

2. Source Data--Original data will be fed directly into the system without "hard copy" evidence.

3. Ledger--Subsidiary ledgers will probably lack prior postings.

4. Files--Not directly readable except as issued by the data processing system according to pre-programming.

CONTENTS

5. Audit Trail--The journal or register is not an element in the EDP system.

New techniques and controls will be needed

New ways of internal control, obviously, must be devised, and they must be included in all original and subsequent program preparation. The auditor should:

1. Participate in forming the ground rules to incorporate in programs, especially in regard to checks and proofs.

2. "Exert pressure for the creation of a 'translation' routine which could convert the coded program into a form he can understand."

3. Insert dummy transactions into the system and inspect the results.

The auditor should also be familiar with reliability checks, and see that they are included in the program, in addition to understanding the built-in ability of the equipment to verify its own operations. Several examples are given of built-in computer characteristics which may be used by the programmer for checks and verifications. These include safeguards against original data entry errors and against destruction of data on tape files.

An interesting result of EDP auditing techniques is the increased trend away from historical posting, since the keeping of voluminous historical records increases the cost of equipment ((tape files, library facilities, etc)). File access, for auditors, will need to be planned in advance, since visual access to files on a demand basis will be impossible. Regarding the audit trail, it will no longer be necessary to keep intermediate journals or entries, but the auditor can, instead, "begin by collecting selected source data to be processed against prior period balances in his possession. The results would be checked against current ledger balances."

SYSTEMS PLANNING FOR COMPUTER APPLICATION

Howard S. Levin, Ebasco Services, Inc.,
Talk presented to SPA Northern New Jersey Chapter, December 1956.

"The information needs of a firm are not necessarily the output of present procedures. Current methods are often a patchwork imposed by machine limitations, supervisory inflexibility, and reaction to business emergencies. As a consequence, the information required for policy guidance and day-to-day operation of the business may not be clearly reflected by current office activity." However, "with present procedures as a starting point, the information engineer can work toward a statement of basic

Information needs are defined and a system developed

information needs" in beginning a redesign of a business information system. This redesign usually evolves in three major stages:

1. Analysis of present information flow patterns and discovery of fundamental requirements.

2. Development of system concepts and selection of equipment.

3. System implementation.

After each step, management review and evaluation is needed, as well as support of the program, in order to aid in attaining positive attitudes toward change among affected personnel, particularly in the middle management group.

In addition to the use of the computer to improve the patterns of information flow and utilization, the systems man can show management the value of scientific methods to aid executive decision, through the use of operations research techniques.

ADMINISTRATIVE AUTOMATION THROUGH IDP AND EDP

Office Management Series No. 144
American Management Association, 1956

The contents of this report are from the AMA Office Management Conference in October 1956. They contain a discussion of the status of IDP by Samuel N. Alexander, Chief of the Data Processing Systems Division of the National Bureau of Standards; a panel discussion by J. Miller Kalbach, Jr., Samuel N. Alexander, Eugene Boulanger, Howard Ellis, Silvio L. Noschese, Norman J. Ream, and Charles Stein, Jr.; and a case study of the Sylvania Data Processing Center by Leon C. Guest, Jr., E. G. Dunn, and James D. Gallagher.

The latter describes some of the considerations which went into the design of the Sylvania communications system, which was found to have two aspects: an extension of the input and output of the data processing system, and a communications system for fast and direct communicating among the various divisions. Equipment was designed to sense the type of information being transmitted and switch it automatically to the proper pick-up device. Plans had to anticipate increased volume, and the engineering problems involved in expanding the message-handling service. A data processing organization was designed which facilitated the interchange of ideas and experience among the systems and procedures group and the Univac systems and Univac programming group.

ELECTRONICS AND MANAGEMENT

R. Glendinning
THE ACCOUNTANT, December 29, 1956; pages 671-673.

Our readers in England will find this an excellent explanation of the role electronic computers can play in management decision-making and control. Several uses are pointed out: to assist in "management by exception," to aid in operational research, and to aid in such management decisions as economic production quantities, shop loading, and production and material control.

CALIBRATION OF ACCOUNTING MEASUREMENTS: AN ANNOTATED BIBLIOGRAPHY

Paul Kircher, University of California at Los Angeles

This annotated bibliography will help those who have wondered what could be done about fluctuating monetary systems, but have not found good material to read. This list begins with the historical background of the problem, and then lists many recent articles suggesting ways of alleviating the problem, including operations research considerations. Twenty-five references are given. A copy may be obtained from the author, addressed to the Management Sciences Research Project, UCLA, Los Angeles 24, California.

Applications

THE PROFITABLE USE OF THE POINT OF SALE RECORDER

Richard Albert, John Wanamaker Co., Philadelphia
STORES, January 1957; pages 20, 21, 24-26, 68.

Retailers are urged to take another look at point of sale recorders as solutions to some of their industry's problems. It is pointed out that while "the electronic computers can add thousands of numbers per second.... they cannot use any of the numbers written by a salesclerk on a salescheck." The point of sale recorder is the solution.

These recorders are seen as aids in four areas of need: 1) automatic charge account billing, 2) complete inventory control, 3) accurate merchandise control, and 4) complete salesclerk control. To illustrate each of these areas a point of sale recorder is used which consists of three units: a keyboard unit (such as a cash register or adding machine), a tag reader for print-punch price tags, and a punched paper tape perforator. All three of the units are connected by cables, and information is transmitted, generally in the order mentioned above. At some planned time, the paper tape is taken to the data processing center where it may be processed by tape-to-card machines, a computer, or similar equipment.

Retail sales information is recorded automatically

In automatic billing three kinds of information need to be recorded on the tape: customer account number (from print-punch customer account plate, or manual entry by salesclerk), amount of sale (manual entry by salesclerk), and identification of sale (method explained below).

Many of the problems attendant to inventory control can be eliminated by the use of the point of sale recorder equipment. For example, when merchandise is reduced in price, the change must be recorded in some record, usually by hand, and is often overlooked. With the point of sale equipment the price change can be recorded automatically with the reading of the original punch marks in the tag, and manually with the salesclerk's punching of the present marked-down price listed on the tag. Other merchandising information could be gleaned from a summary of this information, e. g., pricing weaknesses, unauthorized pricing.

In addition, the recorder could be designed so that it will work only when a print-punch price ticket is recorded as part of the sale. "This assures that every piece of merchandise sold goes through the price change process, making the counting process as accurate as the sales registering process."

In taking inventory the recorder would again be used to read the print-punch price tag. "Every last detail regarding each piece of merchandise would be entered in the punched tape of the point of sale recorder." The resulting punched tape would be used, along with a program planned well in advance, to produce all the information needed. One big disadvantage of conventional inventories in retail stores is the practice of keeping inventories in dollars, with no direct relation to units of merchandise. "With the point of sale recorder and the print-punch price tag, the dollar information and the merchandise identification are both recorded on the print-punch tape. Thus, we will know exactly for what merchandise each dollar was collected." Branch store audit can be helped by the recorder by providing department information from the print-punch tags.

Inventory, merchandise control are improved

In merchandise control three kinds of information are needed: what merchandise has been sold, what merchandise is in stock, and the location of the merchandise in stock (on the floor, floor reserve, stock room reserve, branch store, etc.). Under the present system, a stub must be removed from the merchandise when it is sold, a very unsatisfactory system since "only supervision and conscience prevent the salesclerk from selling a garment without removing a merchandise control stub." However, with the point of sale recorder, "the merchandise control information will be as accurate as the financial controls" and "will help to improve the financial controls, and vice versa."

Keeping a perpetual inventory of stock is made more practical. Since the point of sale recorder will make automatic processing equipment profitable for other purposes such as charge account billing daily summarizing on the equipment becomes possible. "The one-part stub concept... would be a stub which would be the equivalent of one of the sections of the present print-punch tickets produced by Kimball or Dennison. This stub could be inserted into a tag reader without removing it from the merchandise. The tag reader would sense the code holes in the stub and transmit the information contained in these code holes to a punch tape.... Since the ticket was not mutilated in any way by the tag reading process, it could be read over and over again as desired." This would eliminate many of the problems of the present system of having two-, three-, or four-part tags, which are removed one by one as the garment is sold, returned, or remarked.

Location control is simplified by using a point of sale recorder along the shipping line to the branch stores. "A simplified keyboard could be used to indicate to which branch store the merchandise is going."

Salesclerk control, under the present system is involved, especially for departments on a commission basis. "With the point of sale recorder, it is possible to assign every salesclerk in the store a separate number, and to enter this number in the recorder during the recording of the sale.... The salesclerk could use any register in the store, and it would still be an easy matter to collect

total sales for a period. Even more important, since all transactions would at some point go through a point of sale recorder, it would not be necessary to go to the several sources of information other than the register as at present." The use of a salesclerk number would cut down on errors because the clerk would be careful to use her own number in recording sales, and would tend to check the entire register entry. Other sales analysis information can be obtained from this method, such as what kinds of merchandise a clerk sells, error or fraud in selling prices, reasons for cash overages, and which clerks are emphasizing merchandise as requested by the buyer.

"The point of sale recorder is definitely not the type of machine that can be just bought and plugged in. It requires a basic rethinking of the objectives of the organization, and the type of planning that is measured in many years of effort. The quality of this planning and thinking will, to a large extent, determine the success or failure of any particular installation."

Management Decision-making Techniques

INTRODUCTION TO OPERATIONS RESEARCH

C. West Churchman, Russell L. Ackoff, E. Leonard Arnoff, Case Institute of Technology
John Wiley & Sons, Inc., 1957

Introduction to Operations Research is destined to become one of the "bibles" of the practicing operations researcher. The volume contains two types of information: 1) a complete, clear description of the methods of practical OR, which is not confused by philosophical discussions of methodology; and 2) descriptions of OR techniques well illustrated by case histories.

The first 157 pages describe the nature of OR and of the systems which OR analyzes. "An objective of OR. . . is to provide managers. . . with a scientific basis for solving problems involving the interactions of components. . . in the best interests of the organization as a whole." How OR meets this objective by "finding an optimum decision, policy, or design " not just a better one, is described.

Practical OR problems and case studies make this book indispensable

The book, in describing techniques, concentrates on the tools developed specifically in OR: general mathematics, statistics, cost analysis, the use of computers, etc., are not covered, as "good material on these topics is readily available."

Chapter 1 introduces OR; Chapter 2 describes (using an excellent case study), the whole business system with which OR deals. Chapter 3 describes the reasons and use of the team approach. In Chapter 4, the nature of organizations is taught--in a practical, not a philosophical manner.

Chapters 5 through 7 are, perhaps, the heart of the book. Chapter 5 is an unusually clear exposition of the Formulation of the Problem which is a key step in an OR program. The difference between efficiency and effectiveness is made clear. Methods of establishing objectives quantitatively are described, and this is continued in Chapter 6.

Chapter 7, Construction and Solution of the Model, presents a practical description of models, especially symbolic models, and techniques for solution.

Chapters 8 through 19 deal with specific techniques for inventory, allocation, waiting-time (including queuing and "scheduling"), replacement and competitive problems. All of the major OR techniques are clearly presented and well illustrated: e.g., inventory

models, linear programming, queuing theory, and game theory. Excellent bibliographies are given after each chapter. The more sophisticated mathematical treatments are reserved for notes, making the main text easier to read.

Chapters 20 through 22 deal with the vital followup part of OR: gathering data to test models; controlling and implementing solutions (the discussion of management control of an OR solution to a problem after installation is excellent); and the selection and training problems associated with introducing new techniques.

The volume will serve as an excellent text book, even though no specific exercises are included. Mathematics through calculus is required for an understanding of the complete book; however, management personnel who are "prospective consumers of OR" are advised to read at least Parts I, II, III, IX, and X in which the mathematical aspects are held to a minimum. These parts will serve to "explain" OR better than any of the more cursory explanations previously written for management.

The book contains 640 pages. Price, $12.00

Programming

PREVENTION OF PROPAGATION OF MACHINE ERRORS IN LONG PROBLEMS

J. H. Brown, John W. Carr III, Boyd Larrowe and J. R. McReynolds, University of Michigan
JOURNAL of the Association for Computing Machinery, October 1956; pages 348-354.

"Problems which exhaust the facilities of the computer present a situation in which errors caused by intermittent or total component failure cannot be tolerated, and yet where the probability of such errors becomes very high."

The authors describe a highly complex problem placed on the MIDAC which posed such a possibility. "It was decided to make hardware attacks on the obvious weaknesses in the computer system" and to build-in program checks. "It was... decided to integrate all of the checking procedures into one overall system, called the Large Program System (LPS), which could be used for other programs as well.

Checking procedures were programmed into a system for repeated use

"The LPS has two strategic goals: 1) immediate detection of random and continuous errors, with a concurrent isolation of the failing components; and 2) a procedure for recovery from such failures. These aims were generalized into two working rules:

RULE I (The Detection Rule)

Automatic checking, with suitable error print-outs, is to be provided for any equipment whose mean free path between failures is less than the number of operations of that equipment required for the completion of the program.

RULE II (The Roll-back Rule)

An exact copy of the complete correct internal state of the computer is to be recorded automatically in a nonvolatile storage medium at predetermined intervals throughout the computation."

These rules were put into practice in the following manner:

Rule I: 1) All information read into the computer was to be checked via memory summing both on entrance into the acoustic delay lines and on transfer to the drum. 2) All data to be stored on the drum would have attached memory sums to provide checks for all drum transfers. 3) All information punched out would be verified against the internal machine copy before any alterations were made in the stored data. 4) A set of error print-outs were to be selected

to designate the various types of possible component failure.
5) A complete parity check of acoustic storage before transfer to the drum was used to guarantee the correctness of all roll-back information.

Rule II: 1) An exact, checked copy of the complete internal state of the volatile storage of the computer was automatically recorded on the drum with each change of the drum storage, at the time of that change. 2) Based on the daily computer schedule a complete paper tape punch-out was called for after every twelve to fifteen hours of computation.

"Finally, the problem being solved was broken down into four parts for programming, each part to call in and check its successor by a standard procedure. These parts were assigned unique numbers so that in the final synthesis, the machine would print out a code number at the beginning of each of the four stages in the computation cycle, identifying that portion of the total program being executed. Computation for each of the four parts was accurately timed so that the program sequencing could be checked as the computation progressed.

"The entire LPS, independent of the computational part of the program, required about 2000 three-address instructions and constants. . . . "

The authors believe that many of these checking techniques could be built into new computers "allowing for programmed 'automatic recovery' in the case of certain types of failures."

Equipment

SELF-CHECKING CODES FOR DATA TRANSMISSION

George O. Vincent, Western Union Telegraph Company
AUTOMATIC CONTkOL, December 1956; pages 46-48

To those with decentralized input-output systems and centralized computing facilities, the transmission of accurate data is important. In fact, "there is a balance to be struck between time loss from retransmission of the section of data containing an error and the time loss from tautology or signalling redundancy for error checking purposes....If the cost of occasional errors in a particular application is not too great, and the cost of an error-detecting device is relatively high, it is more economical either to accept the errors or to provide a different means of detection."

Various methods of checking data transmitted by teletype

"The 5-channel or 5-level code used in both telegraph and private wire services, consisting of various combinations of 'marking' and 'spacing' pulses, does not in itself provide a self-checking feature." To provide checking some sort of redundancy check is required. "A sixth channel could be added to the standard 5-channel telegraph code and provide error detection by means of a parity check.[1] However, this fails to satisfy the requirements for computer input for several reasons." These are: 1) the telegraph codes have no arithmetic progression; 2) shift function (for letters and figures) are undesirable both for computer operation and telegraph ticker service. "Thus, computer designers have adopted 6-channel codes of their own to obtain code assignments of their own choosing without shift functions. A seventh channel is customarily added for parity checking....

"A 7-channel code is also used...[where] each character has three marking and four spacing pulses. If the received character fails to satisfy this ratio of marking and spacing pulses, the error is detected.

"An 8-channel code...provides four marking and four spacing pulses per character. Errors in transmission are detected if a received character has more or less than four marking pulses."

"The fixed mark to space ratio method of error detection is superior to the parity check for telegraph transmission. The distinction would be minor if the transmission errors were due to random effects. Analysis of actual transmission shows that the fixed ratio check will detect certain errored characters which will be passed by a parity check, while other compensating errors are undetectable by either method."

"Where a higher degree of accuracy is required, the character-by-character parity check may be supplemented by an odd-even check of the marking pulses in each channel of a group of characters. This is sometimes referred to as a horizontal parity checking."

"...examine the situation where the required number of characters is limited to the ten digits. There are exactly 10 code combinations having 2 marking pulses and 3 spacing pulses. Thus, it is possible to apply a '2 out of 5' ratio check to this restricted application....For the general case in which the required number of character assignments is 60 or less, any error detecting scheme for a 5-channel code must insert check characters at appropriate intervals.

"In one method, the transmitted signals include a check character which is added to each block of signals by an insertion unit.... every eighth character...is inserted as a 'parity' check to make each block of eight characters show an odd number of marking pulses in each horizontal channel as transmitted to the circuit. A dropped or added pulse in any block...will change the arithmetic so that lack of parity will appear....

"The check character spacing need not be every 8th character. It could just as easily be every 10th, 12th, or 80th character.... With 8-character spacing, the signals to be transmitted are increased by approximately 14 percent.

"It is possible also to take a six-level code...transmit it on five-unit equipment and preserve the sixth level. For each group of five characters, the [6th] 'bit' is stored in memory equipment, and then [this] group of five...bits is transmitted as the sixth character....

"The five-channel code has long been recognized as a standard ....at the same time...six, seven and eight-unit codes are becoming increasingly popular....It is hoped that all will settle on a common method so that the transmission of 5-unit tape will be compatible to take complete advantage of the tremendous modern plant now operating on the five-unit principle....

New, more flexible units are being designed

"Work is in progress on multi-unit code equipment which will comprise a data communications network, and which ultimately will be capable of transmitting and terminating on magnetic tape for computer operations."

Western Union has under development a system which "will be sufficiently flexible to accommodate five, six, seven or eight-channel codes and will provide automatic error detection and deletion."

"The use of a unit which can provide accurate five-unit transmission without a parity checking channel was explored. Telegraph engineers developed a means of sending the signals for a character, followed by an inversion of the same signal, which are compared at the receiving end, and any errored character thus detected."

Methods of modifying standard 5-channel telegraph equipment to provide character and block checks are under development.

Note:

1. Definitions:

Parity check: use of an extra digit in each character (carried along as a check) which is a 1 (a mark) if the total number of "ones" in the character is odd, and a 0 (a space), if even. Any single digit error will cause a recount of the "ones" in a character to mismatch with the parity character, so the error can be detected.

ELECTRODATA DATAFILE

OFFICE AUTOMATION Up-dating Service, January 1957.

The DATAFILE used with the ElectroDATA system is described in detail. In this system fifty 250-foot tapes are contained in a unit about the size of a deep-freeze cabinet. The tapes are divided into addressable blocks of 200 characters, and move backward or forward over guide-rods at 60 inches a second. The files are controlled by computer command, but may search independently, leaving the computer free for other data processing. Each tape has twin read-write heads which read or write 1 to 100 blocks of information at the rate of 46 milliseconds per block. Each tape carries two parallel lanes of six channels each. Records are stored in the decimal form used in the Datatron Computer. Built-in checking codes and editing processes are included in the DATAFILE design. The price is $25, 000, with monthly rental at $825.

DATA PROCESSING DIGEST

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Comment

PREPARED BY A MEMBER OF CANNING, SISSON AND ASSOCIATES

SOME NOTES ON RENTING VERSUS BUYING AN ELECTRONIC DATA PROCESSING SYSTEM

Some equations are derived for determining when to rent, when to buy

In determining whether to rent or purchase an electronic system the basic problems are 1) actual costs incurred by renting versus those incurred by buying, 2) the probability of obsolescence before the investment on the system is at least recaptured, and 3) tax advantages. We discuss how to analyze a particular situation as to costs and taxes, and then discuss obsolescence.

Disregarding obsolescence in the decision to rent or buy, it is reasonable to say that the choice will be that which has the lowest yearly costs. (We assume a computer has already been justified in general by direct clerical savings and/or other benefits.) The costs may be analyzed as follows:

Let C_e = those costs of changing to a computer which are part of the investment, but are called expenses under the usual accounting system; these would be programming, training, cost of change-over of methods, etc.

C_s = capital expenditures which are 'sunken' or non-recoverable costs, such as physical changes to accommodate the computer, also equipment which cannot be rented, such as especially constructed units.

Note that $C_e + C_s$ are costs incurred whether the system is rented or purchased, and so will not appear in an equation comparing the two.

C_p = cost of purchasing the equipment

C_m = cost of maintenance, if system is purchased

R = yearly rental of system including maintenance

J = yearly operating costs including personnel for continuing programming, operation and supervision; power, space overhead, tape, and paper. (This also is the same whether renting or buying.)

d = fraction of investment depreciated each year (we assume a straight line depreciation; more sophisticated methods could be used, if desired). The entire actual investment will be depreciated at this rate.

t = tax rate (as a fraction) which the company pays on net profit

r = the rate of return which the company can obtain by using its capital in the best way it knows at the time, other than for a computer (i.e., highest rate-of-return possible.)

Using these terms, it can be shown that the following equation applies:

To determine whether to rent or buy calculate:

$$D = (1-t) \left[(r+d)\ C_p - R + C_m \right]$$

If $D > 0$, then rental is indicated.

For example, if

C_p = \$1,500,000

C_m = \$150,000 per year

R = \$600,000 (2 shift rental)

d = .2 (5 year depreciation)

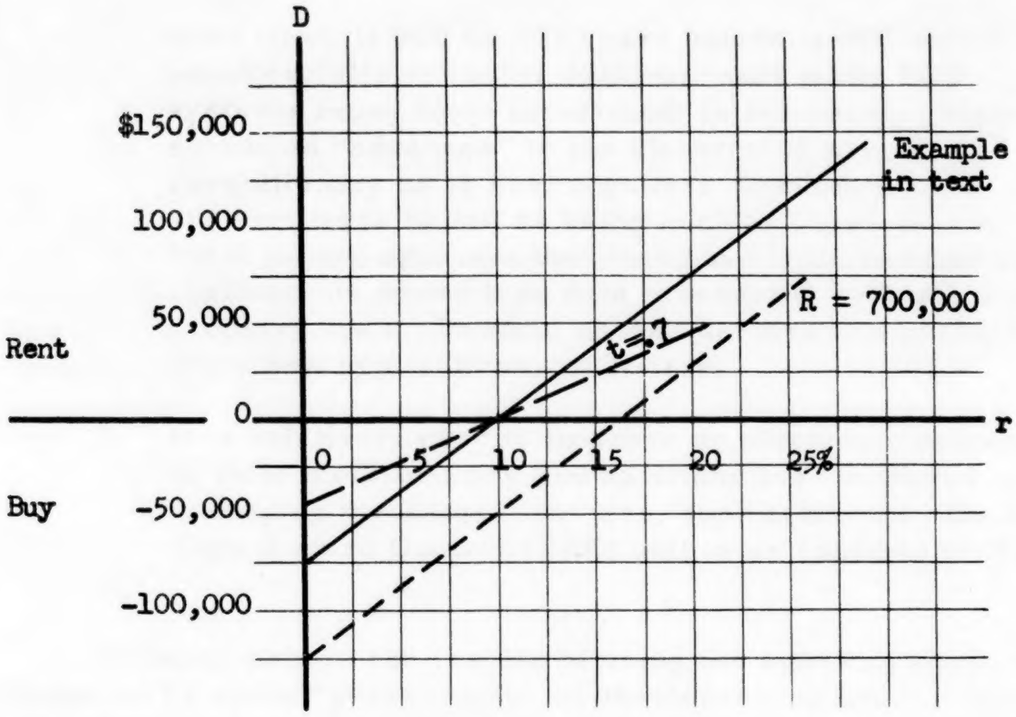
r = .25 (25% return)

t = .5 (50% tax rate)

Then D = +\$187,500, hence one would rent so as to realize this much per year over buying.

Note that if the best investment (other than in a computer) brings 5% so that $r = .05$ then D is \$2,500 - \$37,500. In this case purchase is a somewhat more economical course; that is, management would be wisest to "invest" in the purchase of a computer, rather than some other investment with a 5% return. The effect of other variations is shown in Figure 1. Note that a high tax rate (e.g., $t = .7$) reduces the importance of the decision (lower D), but cannot reverse the decision. Increasing R makes buying more attractive even at high "next-best" rates of return. Decreasing maintenance costs or depreciation would have a similar effect.

Obsolescence is difficult to evaluate partly because, in the computer field, we do not worry about wear as much as <u>technical</u>



YEARLY DIFFERENCE BETWEEN RENTING AND BUYING (D)

VS. BEST RATE OF RETURN (r)

FIGURE 1.

obsolescence; and technical obsolescence is difficult to predict. A new development may occur tomorrow which will make a machine obsolete or it might be years before a real improvement in the design techniques is made.

The technical obsolescence factor has been somewhat overused, however, in justifying renting, considering the following facts:

1. There are fairly large investment costs associated with obtaining a computer. These are:

   (a) Programming costs

   (b) Installation costs--both equipment installation and methods changes.

To obsolete an EDP system, a new system would have to promise savings large enough to absorb any "undepreciated" part of these costs.

2. A second automatic data processing system will be replacing another automatic system and not clerical and tabulating systems. Thus the new system will have to show a large improvement in terms of computations-per-dollar over existing electronic techniques. Such improvements are possible, but even if a revolutionary improvement is discovered

tomorrow, it will be 3-5 years before it will affect commercially available systems--and many EDP systems repay their investment in 3-5 years. Many so-called "advances" in the electronics are not as revolutionary as it first appears: Random access systems were hailed as being such an inprovement, but it is now apparent that they have little to offer in applications where tape data processing systems were properly used. Random access devices are useful in many new applications, of course.

3. It is relatively easy to improve an electronic system by field modifications and additions (as compared to modifying mechanical devices, for instance). The IBM Tape Record Control (TRC) unit is an example of this.

To summarize: the results of using the equation above must be tempered by some "guesstimate" of obsolescence; but in evaluating obsolescence, one should not be swayed by over-optimism about future technical improvements.

References

The addresses of publishers and periodicals mentioned in this issue of Data Processing Digest are listed below for your convenience in obtaining further information about the articles or books listed.

The Accountant
4 Drapers' Gardens
Throgmorton Avenue
London EC2, England

Accounting Review
American Accounting Association
College of Commerce and Business Administration
Ohio State University
Columbus, Ohio

American Management Association
1515 Broadway, Times Square
New York 36, New York

Journal of Association for Computing Machinery
2 East 63rd Street
New York 21, New York

Office Automation
Automation Consultants, Inc.
1450 Broadway
New York 18, New York

Stores
100 West 31st Street
New York 1, New York

John Wiley & Sons, Inc.
440 Fourth Avenue
New York 16, New York

See DPD September 1956 for list of more than seventy periodicals regularly reviewed for significant information in the data processing and related fields.

Training

Orientation Seminars on EDP and IDP, sponsored by AMA

Dates: March 27-29, April 10-12, May 13-15, June 17-19
Place: New York City (Sheraton-Astor Hotel)
Fee: $150 (AMA members) $175 (non members)
Information: American Management Association, 1515 Broadway, Times Square, New York 36, N. Y.

Seminars in operations research presented by Operations Research Institute

Date: One seminar each month through June, 1957
Subjects: Inventory and production management, Linear programming, Forecasting and budgeting.
Information: Operations Research Institute, Inc., 41 Fifth Avenue, New York 3, New York.

Symposium on Systems for Information Retrieval, Western Reserve University School of Library Science

Date: April 15-17, 1957
Place: Western Reserve University, Cleveland, Ohio (Meetings to be held in Masonic Auditorium, 3615 Euclid Ave.)
Fee: $25.00. Conference attendance limited

Electronic Data Processing for Business and Industry, University of California at Los Angeles

Date: April 22-26, 1957
Place: UCLA Hillstreet Building, Rm. 515
Fee: $100
Information: UCLA Engineering Extension, Los Angeles 24, California

Short Course in Operations Research, Case Institute of Technology

Date: June 3-14, 1957
Place: Case Institute, Cleveland, Ohio
Registration: Enrollment is limited to 50
Information: W. W. Abendroth, Conference Director, Operations Research Group, Case Institute of Technology, Cleveland 6, Ohio

Meetings

International Conference and Exposition sponsored by NOMA.

Date: May 12-16, 1957

Place: Los Angeles, California (Statler Hotel)

Information: National Office Management Association, 132 West Chelten Avenue, Philadelphia 44, Pa.

Eighth Annual National Conference of American Institute of Industrial Engineers

Date: May 16-18, 1957

Place: New York City (Statler Hotel)

Session topics: Incentives: Pro and Con; Design of a Management Reporting System; Applying Statistics to Industrial Engineering; Are We Going Overboard with Cost Figures?

International Conference on Operational Research, sponsored by Operational Research Society, Operations Research Society of America, The Institute of Management Sciences.

Date: September 2-6, 1957

Place: University of Oxford, England

Subjects: The common themes in operational research, methodology, applications

Eastern Joint Computer Conference

Date: December 1957

Place: Washington, D. C.

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